

# NAVAL MEDICAL RESEARCH AND DEVELOPMENT NEWS

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## NAMRU-3 in West Africa

*Story courtesy of NAMRU-3 Public Affairs*



*Pictured L-R: Dr. Desmond Williams, CDC Liberia Country Director; Lt. Cmdr. Nehkonti Adams, Officer In Charge of the NAMRU-3 Ghana Detachment; Deborah R. Malac, U.S. Ambassador for Liberia, and Lt. T Joseph Diclaro II, NAMRU-3 researcher. Photographer: Mr. Debo Belvis O'diaji (Director of Information Resource Center, US Embassy Monrovia).*

CAIRO - The 2014 Ebola outbreak in West Africa mobilized many U.S. Government agencies to jointly respond to an unprecedented crisis.

“This event demonstrated how DoD resources can operate to support other governmental agencies responding to public health emergencies and how previously established DoD relationships can be utilized to strengthen efforts pre- and post-crisis,” said Capt. John Gilstad, commanding officer of the U.S. Naval Medical Research Unit No. 3 (NAMRU-3).

NAMRU-3 has been operating in West Africa for nearly two decades and has a Detachment in Ghana and a satellite

laboratory in Liberia.

“After the first few confirmed cases of Ebola were documented in Liberia in 2014, NAMRU-3 assisted in establishing the first Ebola Diagnostic Laboratory at the Liberian Institute for Biomedical Research (LIBR) and provided initial consultation to the Liberian Armed Forces Chief Medical Officer, Dr Josiah George,” said Gilstad.

Throughout the outbreak, staff members from NAMRU-3 and the Ghana Detachment assisted in Liberia and Ghana by manning the Navy Medicine deployable laboratories and providing direct technical support to the Ministries

*(Continued on page 6)*

## NMRC Commanding Officer's Message

I hope everyone had a warm and wonderful holiday and had time to relax and enjoy family and friends. Now we are all well-rested, energized, and ready to move into the New Year and face the interesting challenges that will be coming our way in 2016. Challenges can cause a temporary pause—and that gives us time to take a deep breath and consider possible outcomes. Whatever comes our way, I know your number one work priority will be to continue your mission focus and research productivity. I can't predict the future, but I can tell you with certainty the Navy Medicine Research and Development enterprise is well respected and well known for biomedical innovations that move research forward to support the medical readiness of our Navy and Marine Corps team, their families, and all who depend on us. VADM Forrest Faison, Surgeon General of the U.S. Navy, captured the role of Navy Medicine in his December 2015

*Assuming the Watch* letter to all-hands when he wrote, "Our Navy and Marine Corps are uniquely positioned around the globe defending America. Navy Medicine is entrusted to provide the best care our nation can offer to those who have sacrificed to defend our freedom. The readiness, health, and well-being of those Sailors, Marines and their families are in our hands. In my mind, that is a sacred trust. Whether you are a Corpsman serving with the Marines, a nurse on the night shift, a physician or IDC at sea, a Dental Corps officer in the clinic, a health care administrator, one of our researchers in the field, an instructor in a classroom, one of our shipmates working in IT, Supply, optical fabrication, or any of the hundreds of activities that make up Navy Medicine or whether you are active or reserve, civilian, contractor, or volunteer - your reach spans the globe and you are an important part of fulfilling that trust." We are part of an incredible team—I am proud to be part of Navy Medicine.



NMRC Commanding Officer Sends,  
Jacqueline D. Rychnovsky, CAPT, NC, USN

## NMRC Executive Officer's Message



The Naval Medical Research Center (NMRC) is the headquarters for Navy Medicine's research and development enterprise that includes the NMRC laboratory and affiliated laboratories in the U.S. and overseas. Navy Medicine's research and development laboratories are engaged in a broad spectrum of activity from basic science in the laboratory to field studies at sites in remote areas of the world to operational environments. The capabilities and the geographical locations of the laboratories reflect the broad mission of Navy Medicine's Research and Development enterprise. With a cadre of scientific leadership and technical expertise focusing on force health protection and enhancing deployment readiness, these research teams represent years of experience in science, medicine and the military. In support of the Navy, Marine Corps, and joint U.S. warfighters, researchers study infectious diseases; biological warfare detection and defense; combat casualty care; environment health concerns; bone marrow research and registry; aerospace and undersea medicine; medical modeling, simulation and operational mission support; and epidemiology and behavioral sciences. The goal is to deliver high-value, high-impact research products to support and protect today's deployed warfighters. At the same time researchers are looking to the readiness and well-being of future forces.

NMRC Executive Officer sends,  
CAPT Eric R. Hall, MSC, USN

# Flying in the Dark? NAMRU-D's Night Vision Simulation Lab to Benefit Aviators

By Lt. Cmdr. Dustin Huber, NAMRU-Dayton



*Night Vision Simulation Laboratory housed at Naval Medical Research Unit Dayton aims to develop training scenarios for the next generation of aviation training devices.*

DAYTON, Ohio - We sometimes take our five senses for granted, especially our vision. As our most utilized sense, vision gives us accurate information about our environment, where we are within it, and how it changes as we move. Most don't give this sense a second thought, until our vision is degraded.

Imagine driving a familiar route in the daylight hours, under a clear blue sky. Now picture that same drive under the cover of darkness with a heavy fog or snow shower. Your dashboard, or "cockpit", hasn't changed, other than being lit up. The road ahead no longer looks familiar. Landmarks may be invisible. Attempting to navigate your car via GPS and your console alone seems unthinkable. This is what our aviators do every night!

Although aviators are aided by the most sophisticated night vision technology in the world, there are significant hazards to flying at night, specifically with what we can and cannot see. For example, on dark nights pilots may find themselves descending towards a runway over water or surrounded by darkness. Without other lights or cues from the earth or sky to give them visual cues, they may mistakenly change to an unsafe descent, potentially leading to a mishap. To combat this, Naval Aviation rigorously trains aircrew in both the instrument flight of their aircraft (literally, flying by "dashboard" alone) and in the pitfalls of overreaching our visual capabilities at night.

Now, the Naval Medical Research Unit Dayton (NAMRU-D) at Wright-Patterson Air Force Base, Ohio, offers a brand new

capability in their new Night Vision Simulation Laboratory to combat degraded vision environments by addressing and expanding on this second aspect of training.

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***Scientists at NAMRU-D use a simulator that is compatible with night vision technology, to investigate illusions and visual problems unique to the night environment.***

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The goal is to develop training and scenarios for the next generation of training devices. We know by providing high quality training to aviators in extreme environments, their ability to fly missions effectively and safely improve. That is a win for NAMRU-D, Naval Aviation and the aircrew we strive to protect!



# NAMRU-D and USAFSAM Set a High Bar for Joint Research

By: Dr. Jeffrey Phillips, NAMRU-Dayton



*Dr. Jeffrey Phillips, Principal Investigator, NAMRU-D describes how the Reduced Oxygen Breathing Device (ROBD) is used as a training modality. NAMRU-D and USAFSAM have teamed up to evaluate the differences between the ROBD, a Reduced Oxygen Breathing Environment, and hypobaric chamber hypoxia familiarization training (HAT).*

DAYTON, Ohio - Hypoxia is still a major risk to the safety of aircrew members and operational readiness across the Department of Defense aviation commands. Aviation systems are not equipped with hypoxia detection and instrumentation to warn the aircrew when hypoxia is eminent.

Aircrew members receive hypoxia familiarization training (HAT) to recognize their individual symptoms and to initiate emergency procedures before they become incapacitated.

Since the 1940s HAT has been conducted in hypobaric chambers that work by reducing the partial pressure of oxygen to create a controlled equivalent to the environment a flight crew experiences during a rapid depressurization or a life support equipment failure. Although hypobaric chambers have served as the primary modality for HAT for over 60 years, chambers are expensive to maintain, there is a limit to the number of

chambers available, and there is the possibility of subtle decompression injuries.

To reduce the risk of injury and lower the expense of HAT, the Navy and Air Force are utilizing two normobaric training modalities, (1) the Reduced Oxygen Breathing Environment (ROBE) and (2) the Reduced Oxygen Breathing Device (ROBD) to replace hypobaric chamber HAT.

The ROBE and the ROBD do not alter the barometric environment trainees experience. The ROBE and ROBD simply reduce the concentration of oxygen received by the trainee. The ROBE is a large sealed plastic room filled with nitrogen to train non-mask wearing aircrew. The ROBD delivers hypoxia air mixtures through a standard aviation mask and is intended for tactical operators who wear a mask in-flight.

There are questions concerning the validity of using these two forms of normobaric hypoxia in training as a proxy for hypobaric training (hypobaric chamber). The Naval Medical Research Unit – Dayton’s researchers are working with the United States Air Force School of Aviation Medicine (USAFSAM) team to perform a thorough evaluation of differences between the three training modalities.

Thirty research participants will be placed in each of the three training modalities to directly compare cognitive performance effects and symptom presentation. Data collection began this past summer (2015) and is scheduled to be completed in the spring of 2016.

The combined effort of the Air Force and Navy to address these questions is another example of cross service collaboration as well as an example of how research at the Harry Armstrong Complex at Wright-Patterson AFB benefits both policy and the welfare of the warfighter across the DoD.

## Naval Medical Research Unit—Dayton

The mission of the Naval Medical Research Unit—Dayton is to maximize warfighter performance and survivability through world-class aeromedical and environmental health research by delivering solutions to the field, the Fleet and for the future. The laboratory is Navy Medicine’s world class, global aeromedical and toxicology research leader. Research efforts and innovative products are aligned with operational requirements to solve the naval and joint warfighter challenges of the future.

# NHRC—The Science Behind the Flu

Story courtesy of NHRC public affairs

## *Fever* *Chills* *Headaches* *Body Aches*

SAN DIEGO—Getting the flu isn't fun and it can lay low even the healthiest individual. That's why every year, starting in August, there's a call throughout the military for personnel to get their flu vaccination—it is currently the best protection against the flu.

For the military, keeping our warfighters healthy is key to maintaining operational readiness. Getting vaccinated against seasonal influenza is one simple way to protect the health of our forces and ensure they're medically and mission ready, even during flu season.

***Getting your flu vaccination is a quick and simple process—developing the vaccine isn't.***

It's a complex and lengthy process that takes place every year, requiring the time

and talents of many skilled medical professionals from Navy Medicine, other Department of Defense agencies, academic institutions, and civilian public health organizations such as the Centers for Disease Control and Prevention and the Food and Drug Administration (FDA).

The development of next year's influenza vaccine is actually already under way, and this is where the Naval Health Research Center (NHRC) comes in.

The first step in developing the new flu vaccine is to measure the effectiveness of the current one. Throughout flu season, NHRC receives samples from military hospitals and clinics throughout Southern California and Illinois from patients with flu-like symptoms or febrile respiratory illnesses. Once the samples arrive at the lab, the analysis begins.

The first step is testing the samples for influenza. Positive samples receive further analysis so researchers can identify which strains of influenza are circulating. The influenza virus can be unpredictable and is capable of evolving and creating new strains, which is why researchers also conduct genetic sequencing on a subset of

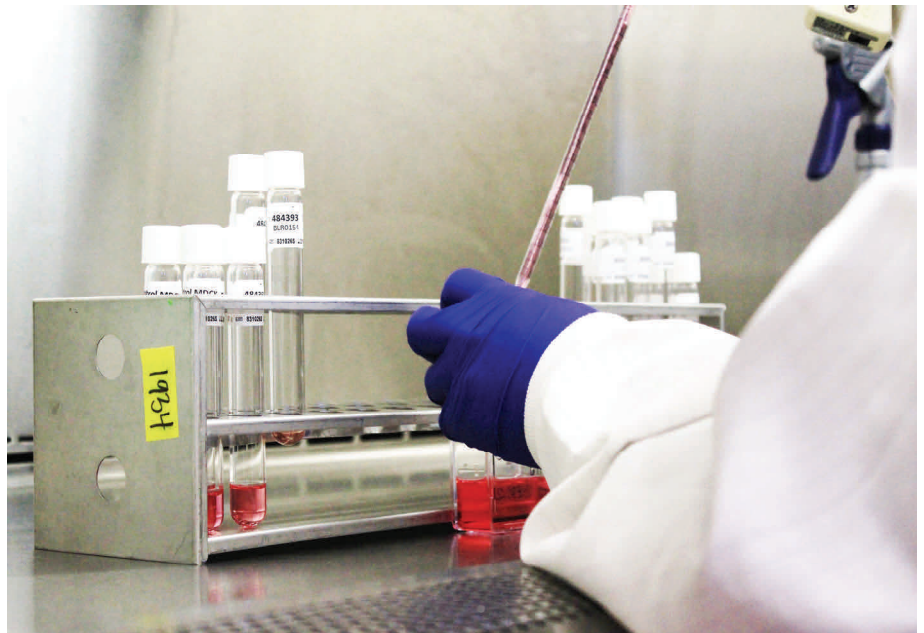
the samples to see how the strains are evolving. The ability of the influenza virus to change over time is why new vaccines are developed every year to ensure it provides protection against the strains known to be in circulation.

After NHRC scientists identify the presence and strain of influenza virus, the team further analyzes the data to determine whether or not patients positive for flu were vaccinated. Based on that information, researchers know how effective the current year's vaccine is.

Once the analysis is completed identifying the presence and strain of influenza virus and the effectiveness of the current vaccine, researchers provide weekly reports with updates on influenza cases and vaccine effectiveness to the Armed Forces Health Surveillance Branch–Global Emerging Infections System. The work done at NHRC contributes to the broader, more global efforts at conducting disease surveillance to identify and combat potential outbreaks.

*(Continued on page 6)*

*Scientists at Naval Health Research Center (NHRC) collect and analyze samples from different military hospitals and clinics to determine if they're positive for influenza. If they do test positive, further analysis is conducted to identify which strains of influenza they contain. Because the influenza virus is unpredictable and capable of evolving, subsets of samples undergo genetic sequencing to determine how the strains are evolving. The ability of the virus to change over time is one reason that new vaccines are developed each year to ensure that it provides protection against strains known to be in circulation.*



# NHRC—The Science behind the Flu

*(Continued from page 5)*

In early April 2009, NHRC found two influenza A cases that were different—they didn't subtype as either of the seasonal strains. Using advanced molecular techniques, NHRC quickly determined the two cases were radically different and they became the first identified cases of the 2009 H1N1 pandemic. This initial recognition of the pandemic strain allowed U.S. public health authorities to respond to the outbreak in a timely manner.

Annually, in February, NHRC staff presents their findings to the Vaccines and Related Biological Products Advisory Committee, the FDA group that decides which influenza strains will go into the next season's vaccine.

Based on the information gathered during the current flu season, scientists predict which strains will be in circulation and

cause the most sickness during the next season. Because the virus is constantly changing, the new vaccine may protect against strains that weren't covered by last season's flu vaccine. And that's why it's important to get a flu vaccination every year.

Even if you were vaccinated last year, over time, your body's immune response declines. Getting your annual flu vaccine offers the best protection against known strains of influenza to help keep you from coming down with the flu.

NHRC is DoD's premier deployment health research center. NHRC's cutting-edge research and development is used to optimize the operational health and readiness of the nation's armed forces.

NHRC's expert team sets the standards in joint ventures, innovation and practical application.

## ***Why is the influenza vaccination more effective some years and less effective in others?***

When a virus changes gradually over time, known as antigenic drift, your immune system may not recognize the new strain, which is why we develop new vaccines each year. But, when the virus has an abrupt and major change a novel virus is created which is something most people have little or no protection against.

An antigenic shift produces a virus not previously found in humans and is the result of animal-to-human transmission, such as swine or avian flu.

## NAMRU-3 in West Africa

*(Continued from page 1)*

of Health in both countries.

"Lt. Cmdr. Nehkonti Adams, Officer In Charge of the Ghana Detachment, was appointed by the U.S. Embassy Accra to chair an Ebola Committee coordinating the U.S. Government's efforts in Ghana, while Lt. T Joseph W. DiClaro from NAMRU-3 returned to Liberia at the request of Dr Fatorma Bolay, Director of the Liberian Institute for Biomedical Research, to assist in collaborative efforts across DoD and other U.S. Government agencies," Gilstad pointed out.

Adams added, "NAMRU-3's positive impact during this crisis was attributed to the established trust that it has built with our in-country partners. Being able to serve as a liaison between agencies such

as the U.S. Agency for International Development and the U.S. Centers for Disease Control and Prevention and with key host country health officials clearly demonstrated the value of our overseas laboratories."

As the Ebola response abated, CDC Liberia country office started to receive their permanent staff.

As further demonstration of NAMRU-3's impact during the outbreak, Adams and DiClaro were personally invited by Deborah R. Malac, U.S. Ambassador for Liberia, to attend the welcome reception for the incoming CDC Liberia Country Director, Dr. Desmond Williams.

"CDC will now have a country office in Liberia to continue to support and expand the health systems structures that were put

in place during the Ebola outbreak," said Gilstad.

Following the Ebola outbreak, NAMRU-3 has continued to utilize its long-standing relationships in West Africa to assist DoD and other agencies to initiate new projects in the region that will provide new research platforms in the interest of public health as well as benefit host countries.

The mission of NAMRU-3 is to study, monitor, and detect emerging and re-emerging diseases of military and public health importance and to develop mitigation strategies against these threats in partnership with host nations and international and U.S. agencies in CENTCOM, EUCOM, and AFRICOM areas of responsibility.



# NHRC Hosts Public Health Scientists from Mexico for Joint Training

*Story courtesy of NHRC public affairs*



*Cmdr. Gary Brice (right) and Capt. Rita Simmons (left), commanding officer, Naval Health Research Center (NHRC), interact with visitors. Brice is the director for operational infectious diseases at NHRC and leads a team of over sixty scientists and technicians in conducting research projects to understand, detect, and support outbreaks of infectious diseases that can affect military personnel around the globe. The work done by Brice's team contributes directly to force health protection by defining critical pathogen threats and directing appropriate intervention strategies. (U.S. Navy photo Released)*

SAN DIEGO – The Naval Health Research Center (NHRC) hosted an exchange visit with four scientists from Mexico's Instituto de Diagnostico y Referencia Epidemiologicos (InDRE) for training in molecular biology, microbiology, and laboratory safety, Nov. 30 - Dec. 4.

The U.S.-Mexico border is the world's busiest port of entry, with an estimated

350 million crossings per year. In addition to the people crossing the border, there is the potential for pathogens to make the crossing as well.

"Since 2004, NHRC has been collaborating with the U.S. Centers for Disease Control and Prevention's (CDC) Border Infectious Disease Surveillance (BIDS) program; InDRE, which is Mexico's version of the CDC,

and county public health departments to enhance infectious disease surveillance activities along the border," said Cmdr. Gary Brice, NHRC's Director for Operational Infectious Diseases.

"We started the annual training in response to the 2009 influenza pandemic," said Brice. "NHRC was the first laboratory to detect the pandemic strain of influenza. The training has expanded over the years to other areas of research that our lab and InDRE share an interest, such as viral and bacterial culture and identification, serology, and laboratory quality checks and assurance."

According to Brice, the collaboration has fostered cooperation and communication between the two countries and their public health agencies. Ultimately, the ongoing, mutually beneficial relationship between NHRC, CDC, InDRE and local public health departments strengthens preparedness for future disease outbreaks and public health emergencies.

As the DOD's premier deployment health research center, NHRC's cutting-edge research and development is used to optimize the operational health and readiness of the nation's armed forces. In proximity to more than 95,000 active duty service members, world-class universities, and industry partners, NHRC sets the standard in joint ventures, innovation, and translational research.

# Evaluation of pharmacokinetic Models for *in vitro* to *in vivo* Extrapolation of High Throughput Toxicity Screening Data

Story courtesy of NAMRU-Dayton

DAYTON, Ohio - In preparation for a February 2016 workshop, the U.S. Environmental Protection Agency and the National Institute of Environmental Health Sciences are offering a series of webinars on the use of *In Vitro* to *In Vivo* Extrapolation (IVIVE) for chemical screening and risk decision making.

Because of the importance of pharmacokinetic models in IVIVE, Dr. Lisa Sweeney, Senior Scientist in the Environmental Health Effects Directorate at the Naval Medical Research Unit Dayton (NAMRU-D) was invited to present on the topic of model evaluation.

NAMRU-D's Environmental Health Effects Directorate studies the toxicity of chemicals and materials used in military operational settings.

Researchers have the capability to study toxic effects of materials using both *in vitro* and *in vivo* systems and then conducting risk assessments.

*In vivo* toxicology includes all potential exposure routes with a specialization in inhalation. *In vitro* toxicology uses animal and human cells lines and tissue models.

Emerging approaches in human health risk assessment rely on determination of biologically-effective concentrations in suites of *in vitro* high throughput screening (HTS) assays.

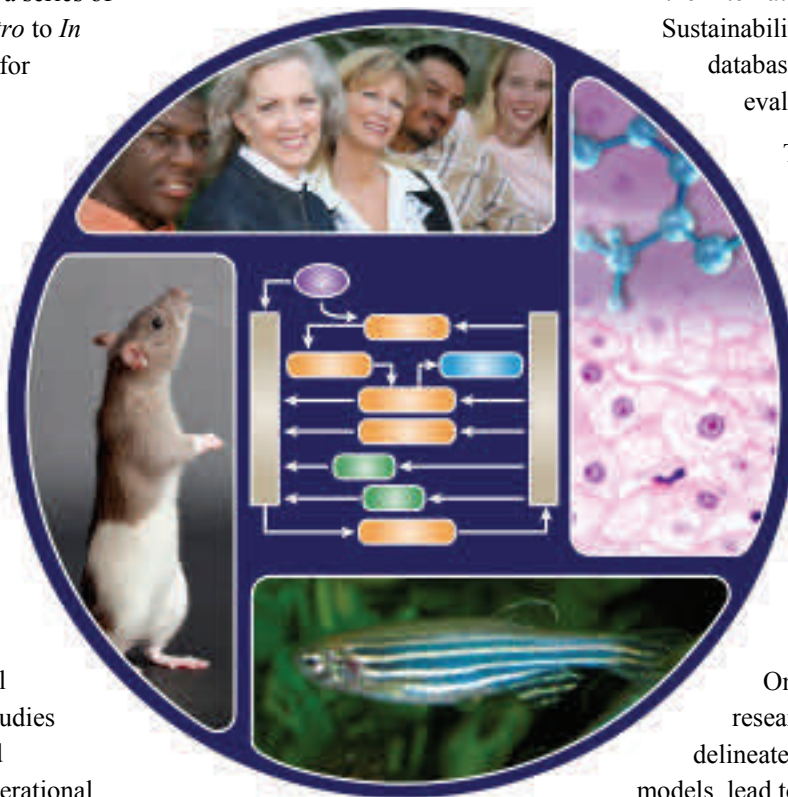
In order to compare human exposure to *in vitro* biologically effective doses, pharmacokinetic models may be used to

and binding to blood plasma proteins) was prepared. Sweeney focused on these simplistic models that are likely adequate for the purpose of prioritizing chemicals in the International Chemical Safety for Sustainability (iCSS) Dashboard databases for more in-depth evaluation.

The iCSS Dashboard (<http://actor.epa.gov/dashboard/>) provides access to the results of more than 800 HTS *in vitro* assay endpoints for over 1800 chemicals, including those from the Toxicity Forecaster (ToxCast) project and the federal Toxicity Testing in the 21<sup>st</sup> century (Tox21) collaboration.

On-going efforts in IVIVE research are expected to better delineate the limitations of these models, lead to strategies for their improvement, and potentially expand the domain of their application in risk assessment. Slides and webinar recordings for the series are currently available at <http://ntp.niehs.nih.gov/pubhealth/evalatm/3rs-meetings/ivive-2016/ivive-2016.html>

The Mission of NAMRU-D is to maximize warfighter performance and survivability through world-class aeromedical and environmental health research by delivering solutions to the field the Fleet and for the future.



Source: National Toxicology Program U.S. Department of Health and Human Services

calculate the exposure levels required to yield internal chemical doses equivalent to the levels of concern. Internal dosimetry is computed either from validated *in vitro* models or predicted from relatively simplistic models parameterized via *in silico* predictive algorithms and limited *in vitro* data.

A case study of the relatively simplistic pharmacokinetics models parameterized with limited *in vitro* data (such as metabolism in cultured human liver cells



# Recent Developments in Triservice Aeromedical Research at Wright-Patterson AFB

By: Richard Arnold, NAMRU-Dayton



*150527-N-DM308-035 PACIFIC OCEAN (May 27, 2015) MH-60S Sea Hawk helicopters assigned to the Indians of Helicopter Combat Squadron (HSC) 6 fly in formation while embarked aboard the aircraft carrier USS Ronald Reagan (CVN 76). (U.S. Navy photo by Mass Communication Specialist 3rd Class Paul Archer/Released)*

DAYTON, Ohio - There has been tremendous growth in joint Navy-Air Force aeromedical research in recent years at Wright-Patterson AFB (WPAFB). Last year a new mechanism to further enhance joint research in aerospace medicine was implemented under the auspices of the Defense Health Agency Joint Programming Committee 5 (JPC-5).

Under a new JPC-5 working group for research in “Aviation Mishap Prevention and Aircrew Health” the Naval Medical Research Unit – Dayton (NAMRU-D), the U.S. Army Aeromedical Research

Laboratory (USAARL), and the USAF School of Aerospace Medicine (USAFSAM) are engaged in seven new joint research projects to address some of the most prevalent threats to the health and safety of U.S. military pilots and flight crew.

Across the military services aviation mishaps account for 50 to 100 service member deaths annually, and the Navy accounts for approximately 75 percent of the service-wide financial losses attributable to mishaps or accidents.

The majority of aviation mishaps are due to human factors or aeromedical causes, and foremost among these is pilot spatial disorientation (SD). Research to understand and mitigate pilot SD receives significant support in the new JPC-5 sponsored program. Dr. Henry Williams of NAMRU-D is leading a project to develop and validate integrated visual, vestibular, and cognitive models of SD to define subsequent mitigation approaches such as improved pilot selection, training, or cockpit engineering approaches.

A USAARL-led project focusing on mitigations for rotary wing brownout illusion, the most prevalent form of SD in helicopters is also a triservice effort with researchers from NAMRU-D and USAFSAM supporting the project.

These new initiatives in SD research are supported by new facilities at WPAFB, specifically NAMRU-D’s one of a kind Disorientation Research Device (DRD), a unique six axis of motion dynamic motion device that provides realistic visual and acceleration conditions of flight. The new program is also supporting research into aviation-related hypoxia and Decompression Sickness (DCS), and spinal pain and injury related to the flight environment. The former research is being executed by USAFSAM and NAMRU-D in collaboration, while the latter is led by USAARL, with support from USAFSAM and NAMRU-D.

***With the reinvigorated triservice focus on the efforts to mitigate aeromedical threats will benefit from cross-service alignment, coordination, and collaboration, which will ultimately return better solutions to the warfighter and better value to the research sponsor.***

# NAMRU-6 Hosts Students in Support of Science Technology Engineering and Math (STEM) Initiatives

*Story courtesy of NAMRU-6 public affairs*

LIMA, Peru – The U.S. Naval Medical Research Unit No. 6 (NAMRU-6) is in a unique position to provide students opportunities to see researchers on the job.

With over 200 scientists and technicians conducting numerous projects, students interested in biology and in scientific research or medicine get to see up close how research on infectious diseases is conducted.

Two recent events are good examples of the lab's STEM outreach efforts.

NAMRU-6 recently hosted a student from the United States Naval Academy, Midshipmen, Nicole Hadler, as part of an International studies program at the Academy.

Midshipman Hadler said, "My objectives for this training were to become familiar with the research at NAMRU-6 to gain a better understanding of the infectious diseases common to this part of the world and to continue to improve my cultural awareness and language proficiency from my daily interactions with the patients and local healthcare workers. After four weeks with NAMRU and the local hospitals I was impressed by the extent to which these objectives were fulfilled".

Hadler split her time between Lima and the command's field site in Iquitos attaining a detailed look at tropical diseases rarely seen in the United States.

With Peruvian Navy doctors, she interacted with Peruvian soldiers who contracted Leishmaniasis on deployment and saw how medicine is conducted in facilities in a developing nation such as Peru.

In Iquitos, she interacted with the Dengue teams, collecting mosquitoes and



*NAMRU-6 recently hosted a student from the United States Naval Academy, Midshipmen, Nicole Hadler, as part of an International studies program at the Academy. MIDN Nicole Hadler gives a scientific seminar on spatial repellents and spatial repellent research in Iquitos, Peru, during the NAMRU-6 scientific seminar series.*

developing a thorough understanding of how the Dengue virus is transmitted.

Hadler added, "One of the best parts about this experience was witnessing the unconditional passion that every doctor, nurse, technician, and researcher at this institution possesses with regards to their particular research cause or study. On a daily basis they selflessly devote 100 percent of their time and energy, working towards preventing and/or treating a wide variety of infectious diseases that are prevalent among the local people."

The command also hosted 30 American and Peruvian seniors enrolled in advanced biology from the Franklin Delano

Roosevelt, American School of Lima. Seeing scientists and discussing research and careers with them was a much appreciated opportunity.

The students saw research on whole organisms (mosquitoes, malaria and leishmania parasites) as well as molecular work for identifying and providing genotypes of virus and bacteria.

NAMRU-6's mission is to conduct research to develop ways to protect U.S. military personnel from infectious diseases at the same time NAMRU-6 makes every effort to inspire the next generation of scientists and physicians.



# New Year – New Career: From Civilian Postdoctoral Research Fellow to Navy Lieutenant

By Doris Ryan, NMRC public affairs

SILVER SPRING, Md. – It's been almost a year since Chase Watters was wearing a maroon lab coat as a civilian postdoctoral research fellow at the Naval Medical Research Unit – San Antonio (NAMRU-SA), San Antonio, Texas. While there his research focused on using enzymatic debridement agents against multi-drug resistant *Staphylococcus aureus* biofilms.

"I am very thankful I had the opportunity to "try before I buy," though as my prior commanding officer advised me, there is no way to replicate being in the military other than being in the military," said Lt. Chase Watters. He added that the commanding officer was right in many ways, as the honor, courage and commitment he witnessed in San Antonio mirrors the environment he is now part of at the Naval Medical Research Center (NMRC).

He pointed out that during his time at NAMRU-SA he met men and women who made their careers in Navy Medicine who were strong charismatic speakers, kind and humorous leaders, and fiercely loyal veterans, and he heard inspirational stories of humanitarian efforts. He had the opportunity to work alongside others from a vast array of scientific disciplines including materials science, electrical engineering, bioengineering, chemical engineering, analytical chemistry, cancer biology, and dentistry.

"As a microbiologist these are a rare assortment of scientific backgrounds to find in one department; a collection of disciplines I would have never come across in the specialized cocoons of academia. I realized that working for the Navy would mean novelty coupled with challenges every day," said Watters.

Today he is a Naval Officer and Microbiologist in the Medical Service Corps. He is currently serving at NMRC in the Wound Infections Department, which falls under the Infectious Diseases Directorate.

"My role in the department is mainly to research and develop novel therapeutics that can combat multi-drug resistant organisms problematic to the warfighter," said Watters.

He went on to explain the projects he is now involved in focus on photodynamic therapy, probiotics, bacteriophage, and the development of an acute care covering for severely injured limbs.

Since joining the department he has collaborated and assisted in the submission of three research grant proposals working with groups from the Naval Research Laboratory, and possible

collaborators in the Netherlands and at the University of Cincinnati.

"I've also submitted an Office of Naval Research In-House Laboratory Independent Research proposal and obtained funding to study the complementation of photodynamic therapy with bacteriotherapy to enhance the resolution of wound infections," he said.

He was also excited to add that his research team found a bacterial probiotic strain that almost completely inhibited all five of the ESKAPE (*Enterococcus faecalis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*) pathogens tested.

"My favorite component about being a Naval Officer is that the Navy stretches you to meet the mission. You wear whatever hat the Navy needs, and this has you always changing, morphing, and evolving into a new and improved creature," Watters said. "In addition to conducting relevant research, I've inspected drug lockers, helped host chili cook-offs, coordinate command urinalyses, and mentored midshipmen with chess at the U.S. Naval Academy. Anytime, and anywhere the Navy takes me next, I stand ready."



Lt. Chase Watters, MSC, USN



## Part I of III: Behnke, Momsen, and the Advent of Submarine Rescue

By Andre B. Sobocinski, Historian, Bureau of Medicine and Surgery

*“Every effort was made to conserve the energy of the men who spent a great deal of time sleeping. The men were instructed to remain calm as excitement would increase oxygen consumption and carbon dioxide output. The oxygen supply and available carbon dioxide absorbent were adequate for about 72 hours.”*

~Lt. Naquin, CO of USS Squalus, May 1939

When it was commissioned March 11, 1939, the Squalus (SS-192) was the pride of the U.S. submarine force. The Sargo-class submarine ran 310 feet in length and could reach a top-speed of 21 knots on the surface (8.75 knots submerged) and tested for depths of 250 feet below the surface.

May 23, 1939, with a complement of 59 crew members aboard Squalus participated in a series of test dives off the coast of Portsmouth, New Hampshire, with her sister ship USS Sculpin (SS-191). The Squalus effortlessly dove into its aquatic habitat and down to the murky deep only to rise again. Down and again. She followed this routine seventeen more times until she couldn't. Instead of ascending to the surface the Squalus sank, drifting down 240 feet onto a shoal some 15 miles southeast of Hampton Beach, New Hampshire.

Those who did not drown in her flooded compartments huddled together awaiting rescue.

*With every minute their hope faded as quickly as their oxygen supply....*

### The Advent of Submarines

The commissioning of USS Holland (SS-1) in October 1900 was a game-changer for the Navy. Although not the first submarine in naval history, the Holland's launching marked a new phase of military strategy and a paradigm shift on how sea battles would be fought and won in the twentieth century. The acceptance of submarine warfare also spawned two new practices in the Navy—undersea medicine and submarine rescue/salvage.



The early gas and diesel-powered submarines posed new health hazards to its crews. As early as 1911, medical officers like Passed Assistant Surgeon I. Franklin Cohn, USN, outlined the deleterious effects of gasoline fumes, the risk of carbon monoxide poisoning, temperature control and “depressing influences” in submerged environments. Later, in 1916, Passed Assistant Surgeon R.W. McDowell appended Cohn's assessment. In his report to the Navy Surgeon General William Braisted, McDowell insisted that special care needed to be taken in selecting personnel for submarine duty and specifically their “temperamental qualifications” and psychological readiness. These early investigations would help frame the field of undersea medicine for future generations.

The same traits that made submarines invaluable naval weapons also altered the landscape for rescue operations. Operations for rescuing crewmembers of debilitated and sunken submarines would require specially trained divers and equipment. The Navy began experimental

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*Lt. Cmdr. Charles Momsen.jpeg – Lt. Cmdr. (later Vice Admiral) Charles “Swede” Momsen was a giant in the field of submarine rescue and salvage operation. In 1939, Momsen lead a team of divers to rescue the crew of USS Squalus. Photo courtesy of the Naval History and Heritage Command.*

# NHRC Participates in JTAPIC Annual Meeting

*Story courtesy of NHRC public affairs*

SAN DIEGO – Staff from the Naval Health Research Center (NHRC) participated in the Joint Trauma Analysis and Prevention of Injury in Combat (JTAPIC) annual meeting, held in San Diego, Dec. 8-10.

“JTAPIC is a virtual partnership of 11 different organizations that gather subject matter experts from the disciplines of intelligence, medical, materiel, and operational aspects of service, and we use that combined synergistic expertise to review injury causing events in the combat theater to prevent injury in the future,” said Col. Colin M. Greene, U.S. Army, Medical Corps, and JTAPIC program manager.

NHRC supports JTAPIC efforts with data from its extensive Expeditionary Medical Encounter Database (EMED) that contains accurate medical data for personnel who

become sick or injured during deployment and tracks them through definitive and rehabilitative care. The database was created to improve medical mission readiness and inform the decisions that shape the medical capabilities of the Department of Defense (DoD).

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***“NHRC is a partner without whom JTAPIC could not function,” said Greene. “We have 11 partners, and they are all important, but the loss of NHRC’s contributions would cripple the organization. They gather most of our wounded in action information, almost all of it really. Any injury information that doesn’t involve death is likely to come from NHRC.”***

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According to Greene, JTAPIC’s mission is to inform solutions by providing analytic data to help decision makers determine the best course of action that will save lives, prevent or mitigate injuries, save money, or direct the spending of money in a wiser and more useful outcome.

“One of our long-term accomplishments includes substantial improvements in some of the armored vehicles that have fought in the U.S. Central Command (CENTCOM) theater, resulting in the avoidance of death or injury,” said Greene. “We’ve also contributed to improvements in personal protective equipment and tactics, techniques, and procedures, all based on our analysis.”

The JTAPIC’s annual review meeting provided the organization and its partners an opportunity to look at calendar year 2015 accomplishments and plan for 2016.

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## ***R&D Chronicles:* Part I of III: Behnke, Momsen, and the Advent of Submarine Rescue**

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*(Continued from page 12)*

diving operations as far back as 1912 and submarine salvaging as early as 1915. The growing need for trained divers to lead deep-sea operations paved the way for the formation of the Naval Expeditionary Dive Unit (NEDU) in 1927. Based at the Washington Navy Yard, NEDU’s mission was to support the fleet through testing and evaluating diving equipment and procedures and lead risky rescue and salvage operations.

From 1937 through 1939, NEDU was headed by Lt. Cmdr. (later Vice Adm.) Charles “Swede” Momsen, USN (1896-1967). The legendary submariner and pioneer of submarine rescue, the “Swede” had earlier recognized the need for effective submarine escape and rescue. In conjunction with others at NEDU

including Cmdr. Allan McCann, Momsen helped invent the submarine escape breathing apparatus (AKA, “Momsen Lung”) and an advanced diving bell (AKA, McCann Rescue Chamber) for deep sea rescues. Interestingly, the work of NEDU would necessitate a new understanding of the undersea environment and the risks of deep sea and extended dives. The first officers to pursue this nascent field of undersea medical research would explore methods for treating and preventing decompression sickness, pulmonary barotrauma and narcosis. Vanguard among these new researchers was Dr. Albert Behnke (1903-1992). In 1937, Behnke would become one of the first physicians attached to NEDU.

### **NEDU Receives the Call**

***... At 11:30 am, May 23, 1939, NEDU was alerted that the Squalus had been lost***

***and told to “Be prepared to leave in two hours.”***

Momsen, Behnke, Master Diver James McDonald and Lt. Cmdr. Oscar Yarbrough, MC, USN, boarded a plane from the Naval Air Station Anacostia to Portsmouth. A second plane carrying Cmdr. Allan McCann, Navy physician Lt. Thomas Willmon, and several corpsmen-divers departed shortly after. Upon arrival they discovered that the Sculpin had briefly established telephone communication with the Squalus earlier in the day. The break in communication ceased at 9:59 PM when the Sculpin detected a faint rapping in Morse code from Squalus, “Conditions satisfactory, but cold.”

***.....Time was ticking away.....***

***Continued -- Part II in the February issue of the newsletter.***